

Technical Note

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cc
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Subject Drop Off Improvement Options

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1. Introduction

Ove Arup and Partners were commissioned by Sherwood Forest Hospitals NHS Trust, to investigate existing operational issues at the drop off facility outside the main hospital entrance, and consider options for improvement. In addition, potential issues with building protection were reviewed in the vicinity of the Emergency Department frontage, and at the main hospital entrance drop off facility.

This note summarises the observed issues, presents various options for improvement and makes recommendations.

Section 2 of this note covers the building protection issues and section 3 discusses the operation of the drop off facility.

2. Building Protection- Hostile Vehicle Mitigation

2.1 Observed Issues

Following two incidents where loss of vehicle control and building strikes occurred, Sherwood Forest Hospitals NHS Trust undertook a site audit and assessment to highlight areas which were felt to be vulnerable to further incidents. As part of this study, Arup have been asked to assess whether additional measures are required at two locations - the main hospital entrance drop off and the Emergency Department frontage. The measures would be short term to retrofit the existing layouts.

The main hospital entrance was identified as a vulnerable location following an incident where a vehicle lost control when exiting the visitor car park, passing between existing bollards and crossing the pedestrian area, before striking the hospital building. No incidents have occurred at the Emergency Department, however the long, straight road on the approach to the building means that concerns have been raised regarding a lack of building protection and Hostile Vehicle Mitigation (HVM).

This section of the report proposes short term improvements which could be provided at both locations to mitigate the potential risks.

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2.1.1 Main Hospital Drop Off

The existing drop off comprises a loop road that provides access to and egress from the visitor car park, and also connects with an internal hospital perimeter road. The drop off itself is located on the north side of the loop road, with a dedicated bay running alongside the pedestrian plaza. A line of bollards runs alongside the length of the drop off and these appear to be spaced at distances varying from c.1.8m to more than 3.0m.

Traffic Advisory Leaflet (TAL) 2/13 produced by the Department for Transport, concentrates on bollards and pedestrian movements in context to the provision of HVM. The document suggests that bollards should be spaced to provide a maximum air gap (between bollards) of 1.2m.

In terms of loss of control incidents, the following locations where a vehicle could cross the pedestrian area and hit a building are considered most vulnerable:

1. The route from the visitor car park exit, as occurred in the incident;
2. On the western perimeter road, south-west of the drop off where an errant vehicle could leave the perimeter road with a small change of direction and access the pedestrian area/building behind the bollards; and
3. Locations along the drop off bay where the existing spacing of bollards is 3m or more, increasing the chances of an errant vehicle overshooting the drop off bays and going between the bollards.

To address the loss of control issues, Figure 1 shows an area of bollards spaced at 1.2m opposite the exit from the visitor car park, and to the southwest of the drop off. In addition, those locations where bollards are spaced at more than 3m should be infilled to have a clear space between bollards of c.1.2m where practicable. This would not however provide full protection from an errant vehicle as there would be areas where the bollard spacing remains wider than 1.2m. The infilling of bollards is not shown on Figure 1 and this approach assumes that the existing bollards are of a standard that offers vehicle protection.

In the context of HVM, it would be necessary to review the bollard provision along the entire drop off frontage. Given that a hostile vehicle on the road through the drop off could turn and drive between the existing bollards, this makes the whole frontage vulnerable. The only way to protect against this, would be to provide vehicle protection bollards at a 1.2m spacing throughout the area. This is indicated on Figure 1 to show the full coverage.

It is worth noting that a hostile vehicle could mount the pavement from the northeast (from Wilmore Way direction) and travel behind the bollards at the drop off. The existing bollard locations do not protect from this route. The Trust may want to consider whether they want to protect against this risk.

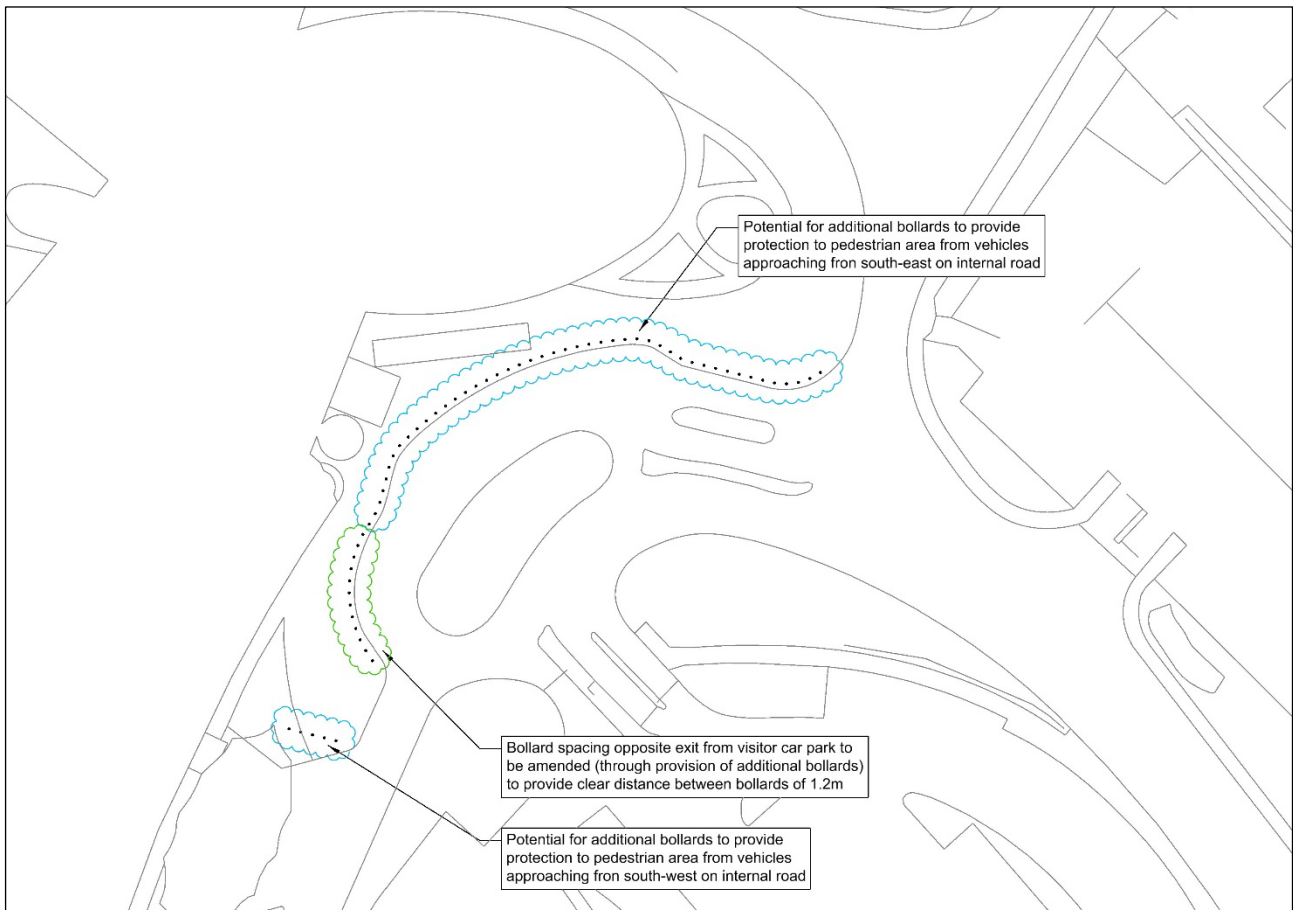
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Figure 1- Main Hospital Drop Off Vehicle Protection



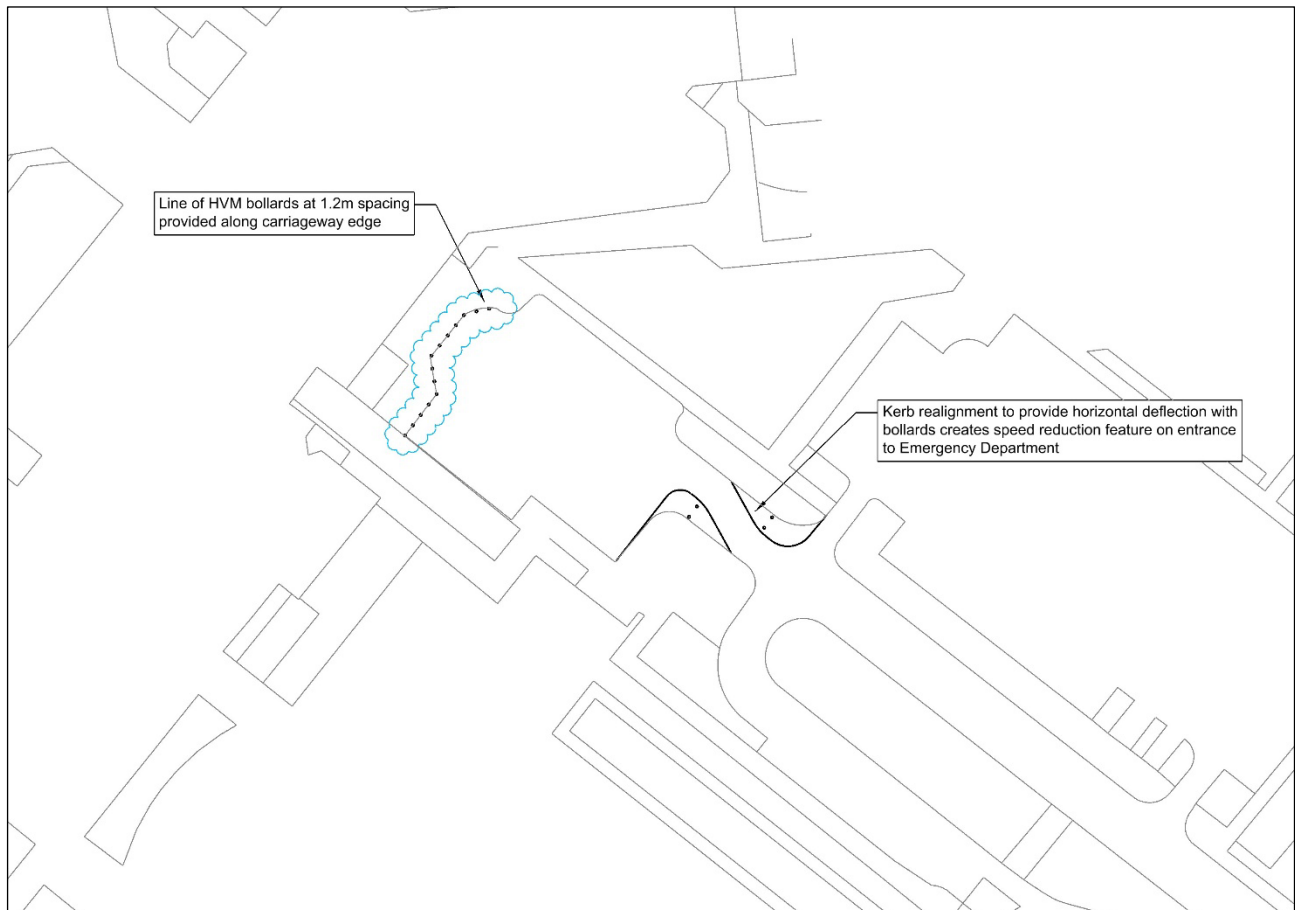
2.1.2 Emergency Department Frontage

The location of the Emergency Department (ED) is at the end of a long, straight approach road, and following an incident at another hospital, is considered vulnerable to either loss of control incidents or hostile attack.

Figure 2 shows two potential measures to improve vehicle protection to the ED.

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Figure 2- Emergency Department Proposed HVM



The main intervention provided is the vehicle protection bollards at a spacing of 1.2m near the building frontage. The bollards would sit within the current area of carriageway to retain sufficient space for a pedestrian route to the rear of the bollards, however this is not anticipated to create issues with vehicle manoeuvres.

As a potential additional measure, kerb realignment is shown on the entrance to the ED frontage, to provide a speed reduction measure in the form of a one-way chicane incorporating HVM bollards. This would be a kerbed buildout and could either be constructed as an extension to the existing footway or as a landscaped area to help soften the ED entrance. The introduction of a chicane on the entrance to the ED area would also potentially allow a reduced specification of vehicle protection bollard fronting the ED building, as a result of reduced vehicle approach speeds.

Alternative options were considered, including the provision of a rising barrier / rising bollard at the entrance to the ED area, however potential issues with equipment failure and staffing requirements to operate the barrier / bollard intercom were felt to outweigh the potential benefits. Similarly, vertical deflections were not considered appropriate on a blue-light vehicle route, and were not felt to offer significant benefits.

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2.2 Building Protection- HVM Conclusions

To meet the DfT guidance on Hostile Vehicle Mitigation measures the bollard spacing should provide an air gap (between bollards) of 1.2m. Vehicle protection bollards should comply with BSI PAS 68 standard.

Three areas around the main entrance drop off are considered to be more vulnerable to loss of control vehicles. Two of the areas should have vehicle protection bollards at a spacing of 1.2m. In addition, those locations where bollards are spaced at more than 3m should be infilled to have a clear space between bollards of c.1.2m where practicable. This approach would not however provide full protection from an errant vehicle as there would be areas where the bollard spacing remains wider than 1.2m (potentially up to 3m).

In terms of HVM, this would require vehicle protection bollards at a 1.2m spacing throughout the drop off area.

Vehicle protection bollards should also be installed at the ED frontage to protect from hostile vehicles. Whilst not considered essential, the provision of a separate chicane feature on the approach to the ED parking area could also be considered, to help reduce vehicle approach speeds and potentially reduce the specification of the protective bollards along the ED building frontage.

3. Main Hospital Drop Off Operation

3.1 Existing Operation

A site visit was undertaken on 13th July 2022, during which time a number of issues were identified at the main hospital drop off. These can be summarised as follows:

- Use for pick-up which results in a longer duration of stay and less parking availability for drop off;
- Inconsiderate parking within the drop off - including double parked vehicles - which blocks the flow of traffic to and from the drop off, as well as the exit from the visitor car park and the northbound exit from the western perimeter road;
- Queues blocking back along the access road, as a result of inconsiderate parking and congestion within the drop off which blocks the entry to the visitor car park and the western perimeter road;
- Use for small deliveries where unloading takes time;
- Some confusion over which lane to be in to access the visitor car park; and
- The unused bus stop/dedicated bus lane has the potential to be confusing.

In addition, during the client inception meeting, issues with errant vehicles driving across the footway were noted, where bollards are too widely spaced along the edge of the footway, which has resulted in vehicles entering the pedestrian area and impacting the building. These comments were addressed as part of the first section of this report.

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3.2 Proposed Drop Off Options

It was not clear from the site visit, whether the drop off had sufficient capacity (drop off spaces) to meet demand, due to the misuse that was apparent. The following options do not therefore seek to increase the capacity of the drop off facility but are more focussed around improving the operation of the area. All options would require enforcement to prevent misuse of the drop off e.g. for pick up.

Six options have been considered which vary in scope of works from a minor reconfiguration to a full reconfiguration of the drop off and short stay car park accesses. In all options, bollards would be required along the line of the drop off at a maximum spacing of 1.2m, to prevent errant vehicles from entering the pedestrian area.

The proposed options are described below.

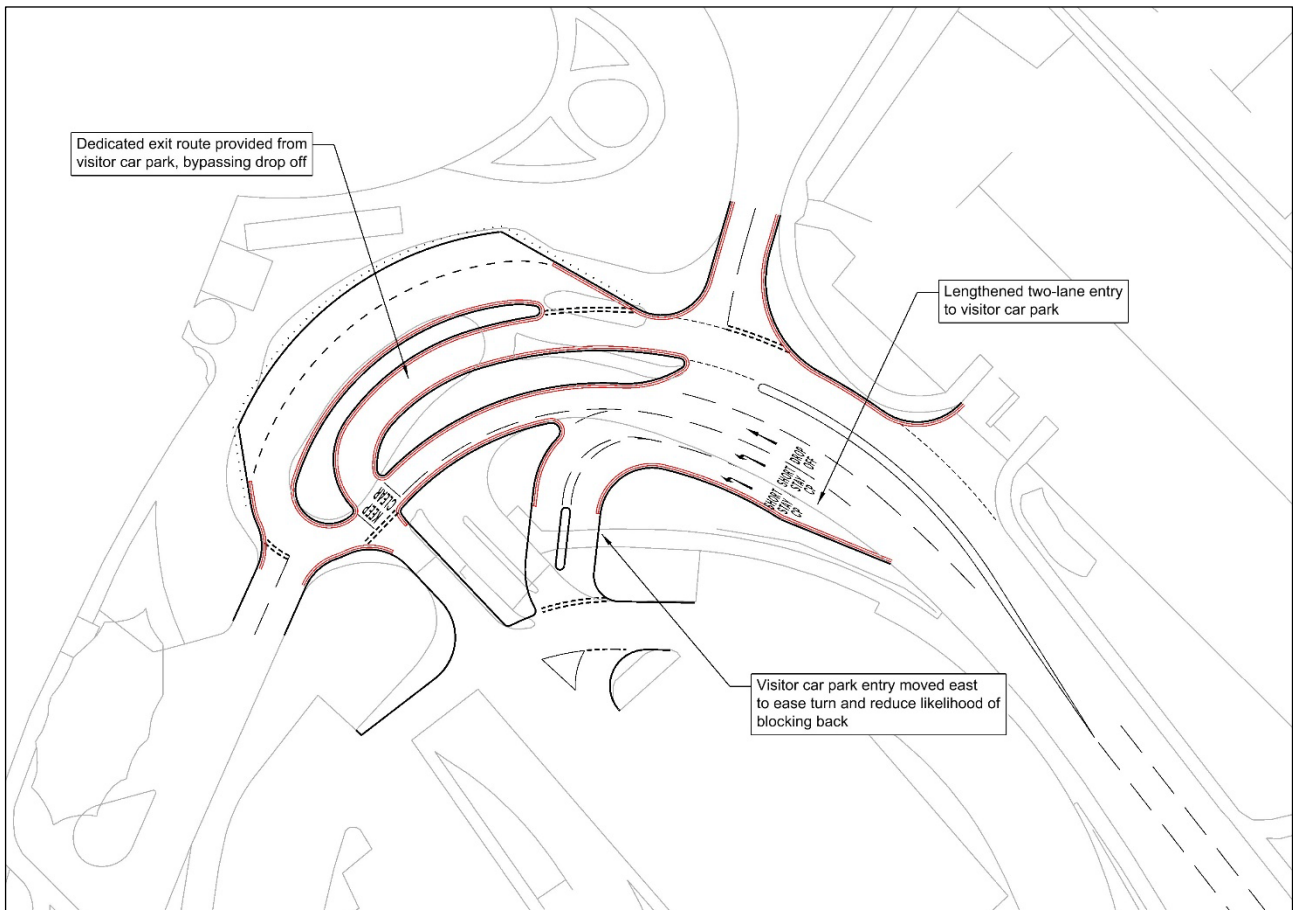
3.2.1 Option 1

Option 1 comprises a complete reconfiguration of the existing drop off. The entry point to the short stay car park is moved east to ease the entry manoeuvre, with an increased length of two-lane approach to minimise the potential for blocking the main access road at peak periods. This also reduces the likelihood of congestion at the drop off blocking entry to the visitor car park.

Realignment of the inbound drop off road also allows the provision of a segregated exit route from the short stay car park, which operates independently of the drop off lane. This helps to reduce the risk of vehicles exiting the car park from being held up by vehicles queuing for the drop off facility, which could make use of the visitor car park for pick up (as intended) more attractive.

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Figure 3- Option 1 Layout



Advantages of this option are:

- The segregated visitor car park exit lane enables exit from the car park when the drop off is congested;
- Changes to the short stay car park entry increases capacity, and reduces the chance of vehicles blocking the main access;
- The bus lane and bus stop are removed, rationalising the area and removing clutter; and
- The drop off is moved slightly further from the building line, increasing the pedestrian area.

Disadvantages of this option are:

- There is no recirculation lane from the drop off to the visitor car park entry;
- Significant reconfiguration is required;

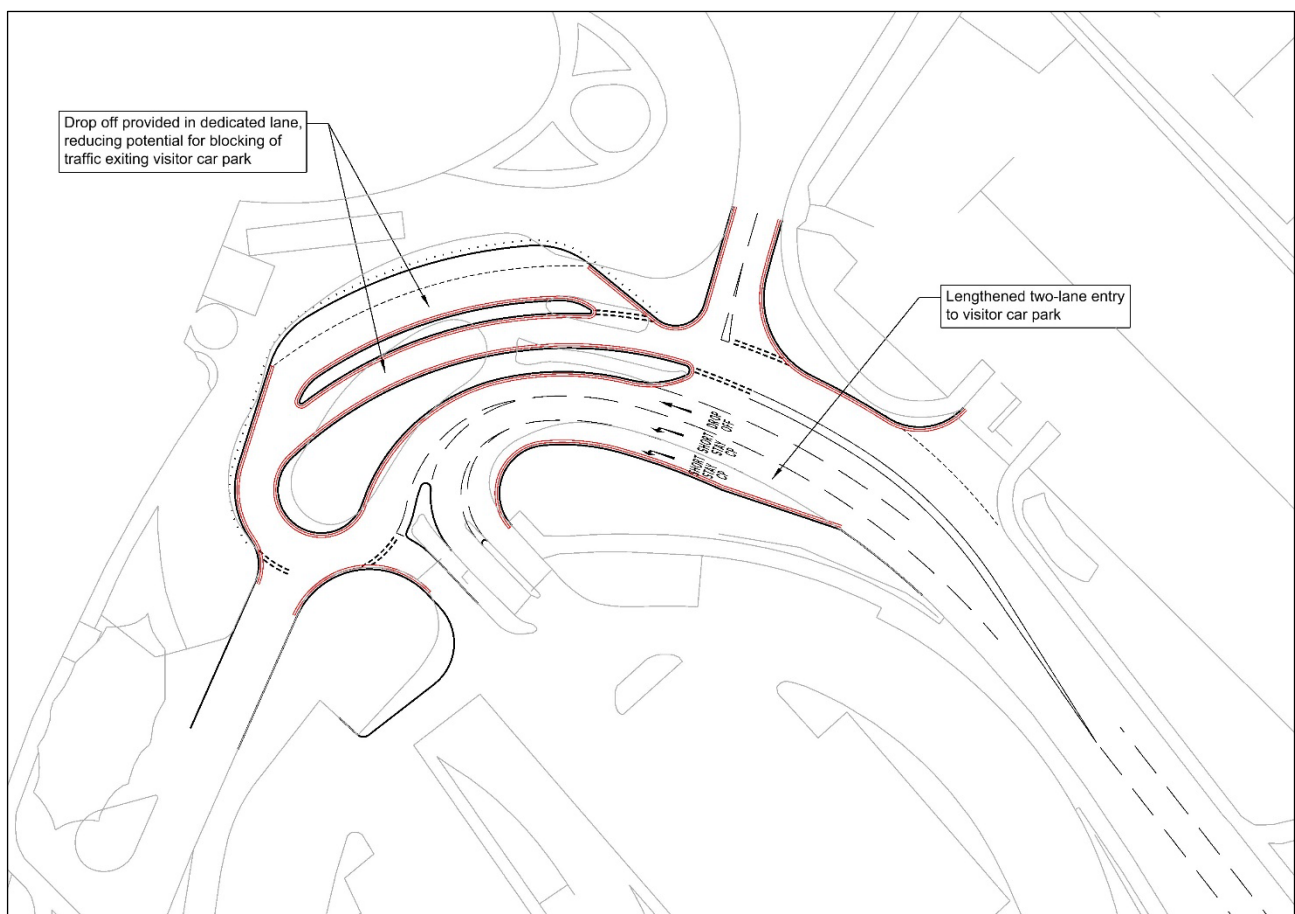
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- The proposed road layout is unorthodox, which may lead to some confusion unless carefully signed;
- Access to the western perimeter road would not be improved; and
- Existing issues with congestion may still occur if the drop off is not managed correctly, i.e. preventing inappropriate use.

3.2.2 Option 1A

In this option, similar principles to Option 1 are followed, whereby a segregated drop off and dedicated exit from the car park are provided, together with improvements to the capacity of the visitor car park entry through the provision of a two-lane approach.

Figure 4- Option 1A Layout



Advantages of this option are the same as Option 1.

- The segregated road would provide the exit from the car park and for northbound movements from the western perimeter road without needing to go through the drop off;

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- Changes to the short stay car park entry increases capacity, and reduces the chances of vehicles blocking the main access;
- The bus lane and bus stop are removed, rationalising the area and removing clutter;
- Enables double parking within the drop off without blocking the car park exit or the western perimeter road; and
- The drop off is moved slightly further from the building line, increasing the pedestrian area.

Disadvantages of this option are:

- There is no recirculation lane from the drop off to the visitor car park entry;
- Significant reconfiguration is required; and
- Existing issues with congestion may still occur if the drop off is not managed correctly, i.e. preventing inappropriate use.

3.2.3 Option 2

In this option, the overall scope of works is reduced compared to options 1 and 1A. The proposed extent of reconfiguration to the existing drop off is minimised, through retention of the existing short stay car park entry and exit. Removal of the bus lane / bus stop helps to provide additional pedestrian area whilst simplifying the overall highway layout, and providing the opportunity for clearer vehicle signage and road markings on the approach to the hospital frontage.

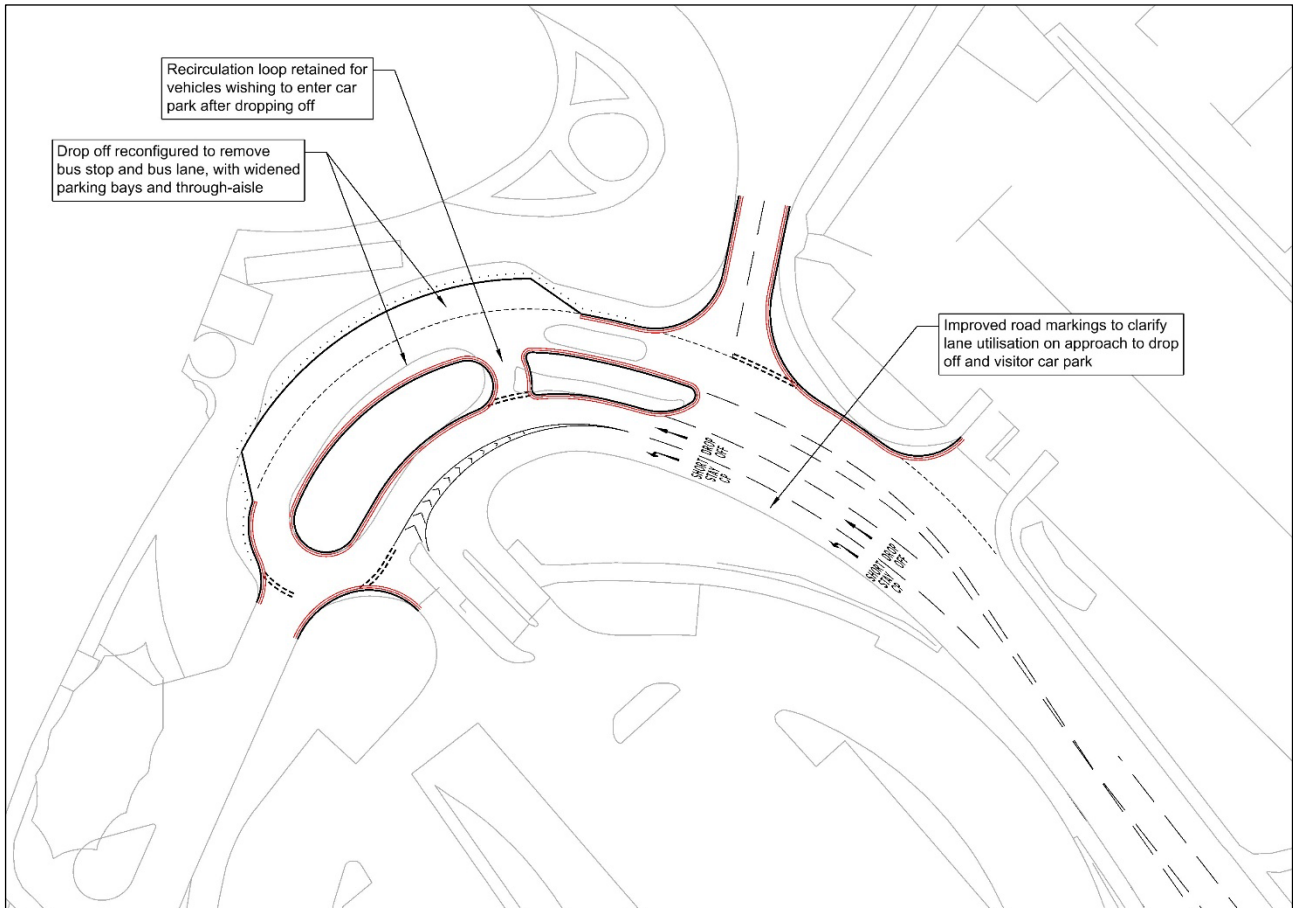
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Figure 5- Option 2 Layout



Advantages of this option are:

- The bus lane and bus stop are removed, rationalising the area and removing clutter;
- The drop off is moved slightly further from the building line, increasing pedestrian area; and
- A recirculation lane is retained between the drop off and visitor car park entry.

Disadvantages of this option are:

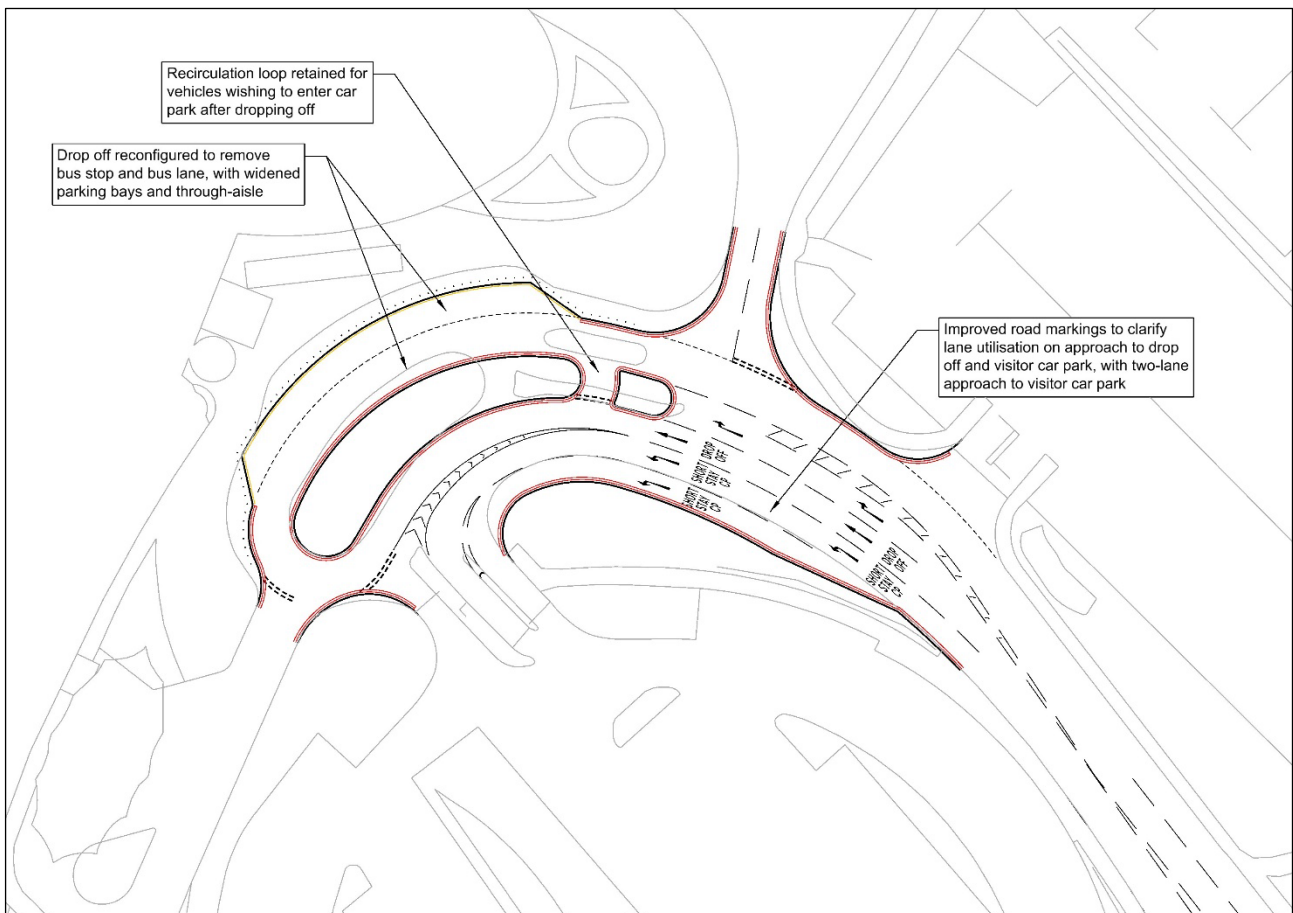
- No segregation of vehicles exiting the visitor car park or vehicles using the western perimeter road;
- No capacity improvements to the visitor car park entry;
- Existing issues with congestion may still occur if the drop off is not managed correctly, i.e. preventing long term or inappropriate parking.

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3.2.4 Option 2A

This option is a variant of Option 2, whereby a similar layout to the existing drop off is retained whilst providing capacity improvements to the visitor car park entry, through provision of a two-lane approach.

Figure 6- Option 2A Layout



Advantages of this option are the same as Option 2 plus:

- Increased entry lane capacity is provided at the short stay car park.

Disadvantages of this option are:

- No segregation of vehicles exiting the visitor car park or vehicles using the western perimeter road; and
- Existing issues with congestion may still occur if the drop off is not managed correctly, i.e. preventing inappropriate use.

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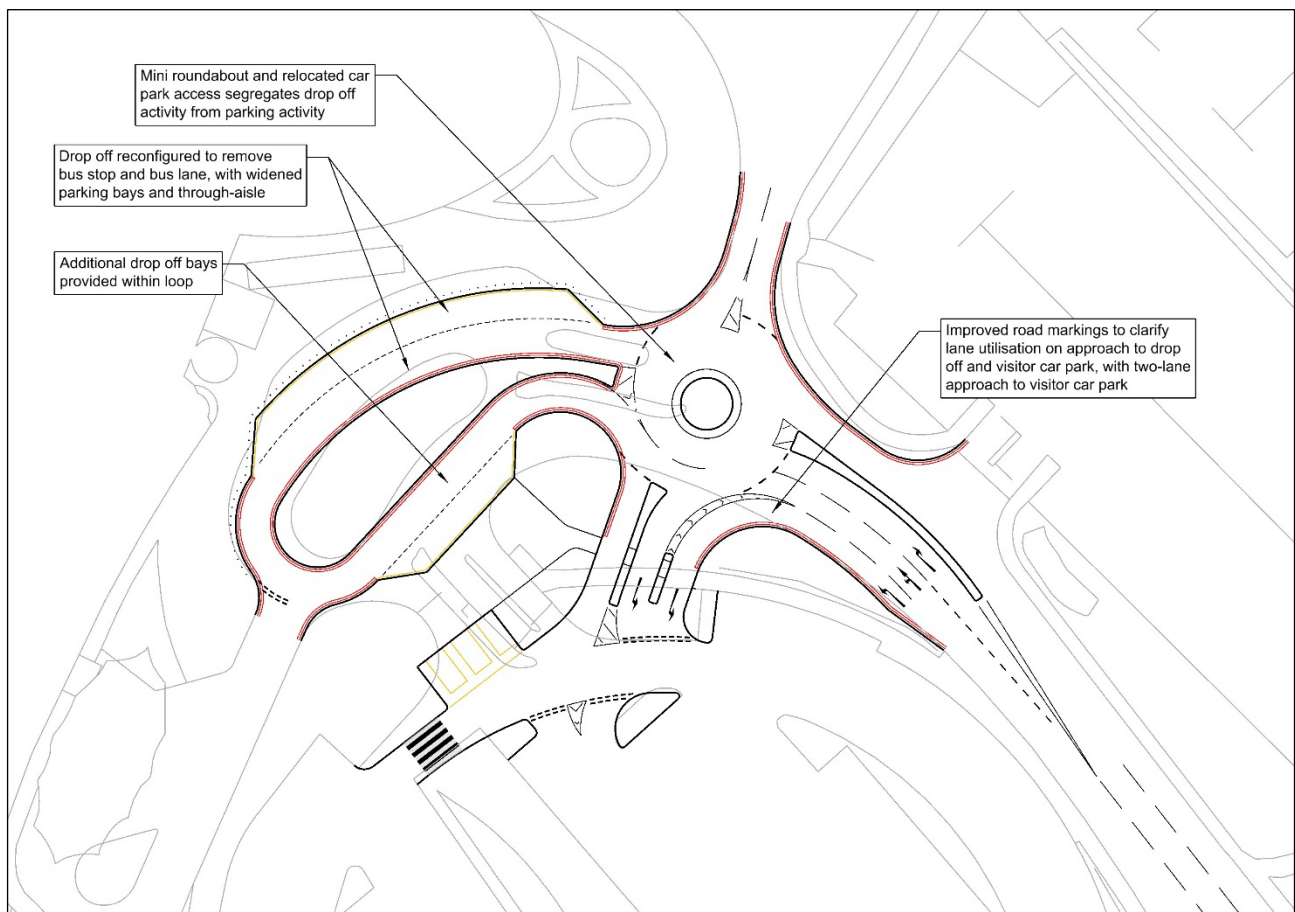
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3.2.5 Option 3

This option proposes reconfiguration to the entirety of the existing drop off area, together with amendments to the short stay car park to provide complete segregation between drop off and car park related activity. The bus lane and bus stop is also removed as part of the proposals to increase pedestrian area outside of the hospital frontage.

A mini-roundabout is proposed to the east of the drop off, with access to the car park and access to the drop off/western perimeter road off separate arms. This enables an increased number of drop off spaces to be provided. Internal reconfiguration of the car park is required to accommodate the mini-roundabout and relocated entry / exit barriers, with a small increase in the number of parking bays possible within the car park (3 additional disabled bays).

Figure 7- Option 3 Layout



Advantages of this option are:

- Complete segregation between drop off and car park related activity, reducing the likelihood of the car park exit being blocked;
- The bus lane and bus stop are removed, rationalising the area and removing clutter;

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- The drop off is moved slightly further from the building line, increasing the pedestrian area;
- A recirculation facility is retained between the drop off and visitor car park entry; and
- Increased capacity is provided at the visitor car park entry and within the drop off.

Disadvantages of this option are:

- Significant reconfiguration is required;
- Existing issues with congestion may still occur if the drop off is not managed correctly, i.e. preventing inappropriate use.

3.2.6 Option 4

This option proposes removal of the dedicated drop off area along the hospital frontage, and instead proposes a drop off aisle within the visitor car park. As per Option 3, a mini-roundabout junction is indicated at the entrance to the short-stay car park, which helps to clarify the removal of the dedicated drop off facility and simplifies the road layout.

Internal reconfiguration to the visitor car park layout is also indicated, to maximise the parking provision within the remaining area.

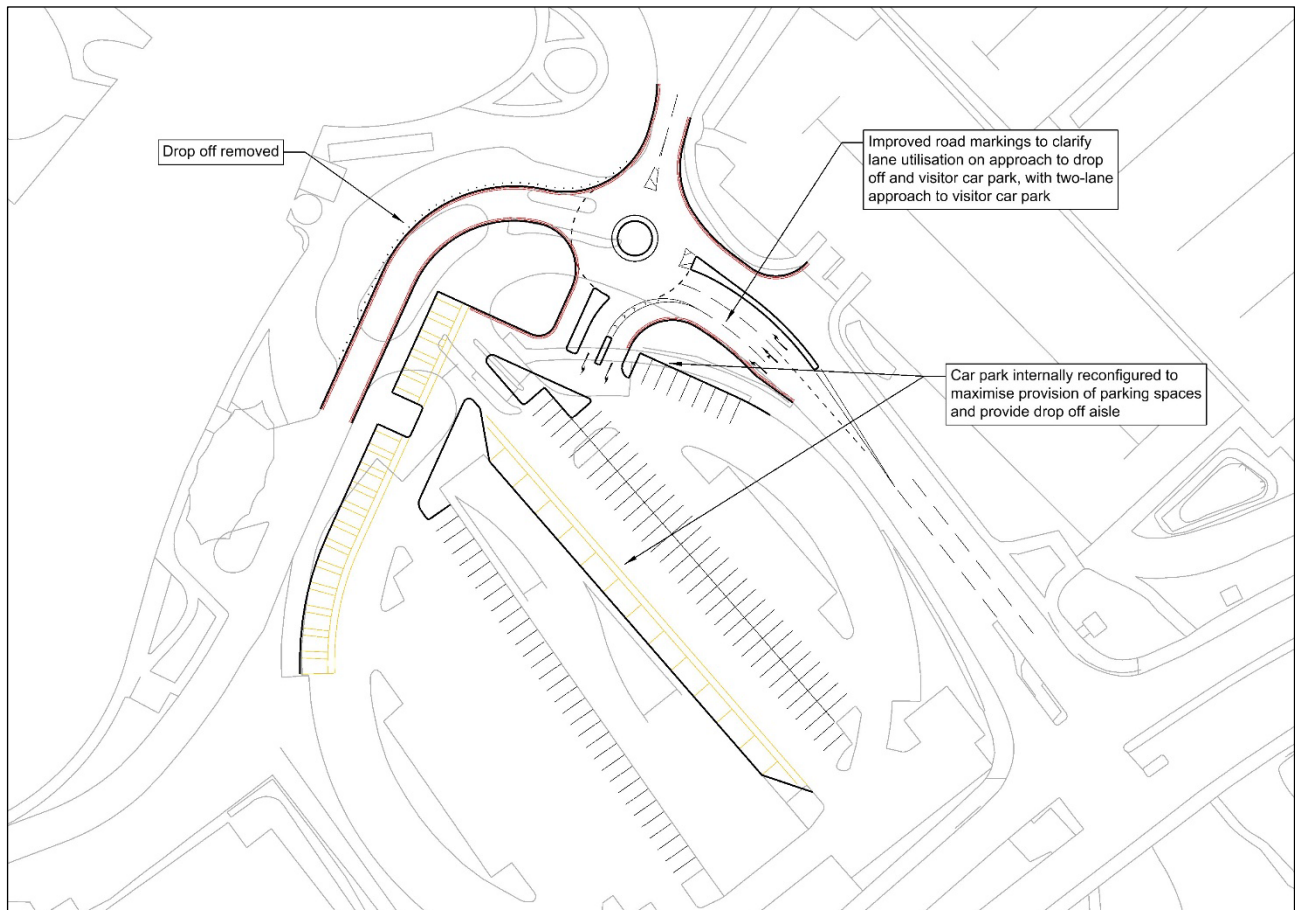
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Figure 8- Option 4 Layout



Advantages of this option are:

- Removal of the drop off along the hospital frontage removes the conflict between drop off, car park exit and western perimeter road movements, improves safety for pedestrians and increases the pedestrian area;
- The drop off is relocated within the visitor car park, keeping all vehicle activity in a single location, with drop off activity positioned alongside the main pedestrian throughfare;
- No recirculation required to park after dropping off a patient; and
- The bus lane and bus stop are removed, rationalising the area and removing clutter.

Disadvantages of this option are:

- Significant reconfiguration is required;
- Potential for increased queuing as a result of increased demand at car park entrance barriers;
- Reduction in the number of parking spaces within the visitor car park;

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- Increased walk distance between the drop off and hospital entrance; and
- Issues with congestion may still occur if waiting / stopping restrictions are not enforced along the access to the western perimeter road (in front of the hospital entrance).

3.2.7 Option Summary

The pros and cons of each option are summarised in the table below.

Table 1- Option Summary

Option	Advantages	Disadvantages
1	Segregation between drop off and car park, slightly increased pedestrian area, increased car park entry capacity, bus lane/stop removed	No recirculation between drop off and car park entry, significant reconfiguration required, unorthodox layout, no improvement to western perimeter road access, enforcement required
1A	Segregation between drop off and car park, slightly increased pedestrian area, increased car park entry capacity, bus lane/stop removed, enables double parking in drop off without blocking car park or perimeter road	No recirculation between drop off and car park entry, significant reconfiguration required, enforcement required
2	Bus lane/stop removed, recirculation loop retained, slightly increased pedestrian area	No segregation between drop off/visitor car park/perimeter road traffic, no capacity improvement to car park entry, enforcement required
2A	Bus lane/stop removed, recirculation loop retained, slightly increased pedestrian area, improved car park entry capacity	No segregation between drop off/visitor car park/perimeter road traffic, enforcement required
3	Complete segregation between drop off/car park activity, increased drop off spaces, bus lane/stop removed, increased pedestrian area, recirculation loop retained	Significant reconfiguration required, enforcement required
4	Removes conflict between drop off/visitor car park/perimeter road traffic, increased pedestrian area, no recirculation required, bus lane/stop removed	Significant reconfiguration required, loss of car parking spaces, increased walk distance between drop off/hospital entrance, potential for congestion in car park/on main access road due to intensification of use, enforcement required

3.3 Drop Off Conclusions

A number of issues with the existing drop off were observed from a site visit and discussions with the Trust. These included inappropriate use of the drop off, inconsiderate parking, queues blocking the visitor car park, perimeter road and the main access road, and some confusion over which lane to be in.

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Several options designed to improve the operation of the area around the drop off have been considered. All options would however require enforcement to prevent misuse of the drop off area. Given that this would be the case, it is recommended as a starting point, that enforcement should be used with the existing drop off arrangement to see if this could resolve the issues, or at least some of the issues, without the need for extensive reconfiguration, which could have a large up-front cost and is likely to cause disruption to operations during construction.

Options to enforce correct use of the existing area for drop off include:

- Enforcement officer for waiting restrictions – preventing non-drop off trips, double parking; and
- Automatic Number Plate Recognition (ANPR) and penalty notices based on duration of stay.

An enforcement officer would be physically present at the drop off area and would be required to intervene and speak to drivers in the event that misuse of the drop off was observed. The application of ANPR technology would enable automatic issuing of penalty notices to vehicles which parked in the drop off area for longer than a permitted period of time. Depending on the complexity of the system, this could potentially also observe and penalise inappropriate parking, i.e. double parking.

Improvements to directional vehicle signage would also help to provide clarity to the hospital approach, where the existing ‘get in lane’ signage is of a non-standard design and is too small to be effective. Similar improvements to signage at the drop off itself would also be beneficial in terms of highlighting the ‘no waiting’ nature of the drop off.

In addition to enforcing correct use of the existing layout, the current spacing of bollards would need narrowing to be no more than 1.2m apart to protect pedestrians and the building frontage from errant vehicles.

If issues remain following the application of enforcement measures, physical improvements to the layout of the hospital frontage should be considered to improve its operation. The most appropriate of the six options will depend on the residual issues following enforcement of the existing arrangement. If the genuine demand for drop off is greater than the existing provision, then consideration would need to be given to increasing the drop off spaces within the options outlined in this note.

DOCUMENT CHECKING

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